Project Report

on

**EXPERT SYSTEM FOR DETERMINING HOME OWNERSHIP**

**Master’s in Science in Computer Science**

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**1.Project Description**

* 1. Objective

The objective of this project deals with the design and implementation of an expert system for eligibility of becoming a house owner. The house ownership process can be categorized into two steps and they are, at what amount of money can a potential buyer purchase a house and where can he get the suitable house according to his affordability. The Expert system is motivated by the need to guide home buyers to estimate their purchasing power in a given city.

Particularly, it is expected that the proposed design would ensure that home buyers have proper assistance in times of where the buyer is unsure of his decision and when are too many options and what’s more will save them from lots of personal investigation on their own for qualifying to buy a house.

* 1. Scope

This is a detailed project report for semester group project work on an Expert system, when we run the Expert system it calculates the maximum amount of loan that a buyer can borrow from a lender, calculates the debt to equity ratio, it suggests what kind of home you can buy for a given price(after calculations) in the desired city and it also suggests other cities with the house size where the buyer can qualify to buy a house. It also calculates the expected mortgage interest rate for a buyer's credit score.

**2.Method Used**

Step 1:

We started figuring out debt to income ratio

The debt to income ratio is a calculation that banks use to figure out whether the given customer can pay back the loan within the period given.

The passing mark for a customer is 43% of his monthly salary. If the customer is above 43% most bank tend to not offer a loan to a customer. The debt to income ratio is the golden rule for a mortgage.

Step 2:

Calculate the property tax rate of the given city and also calculate the user's mortgage interest rate using their credit score.

Step 3:

Find out the maximum monthly payment a given user can pay, using this monthly payment we can calculate the maximum monthly mortgage the user can pay, this calculation involves debt to interest ratio, interest rate, property taxes.

Step 4:

Using the resultant loan amount obtained from the above steps, the system finds whether or not the end-user is eligible to buy the house. If he is eligible he will be displayed with the Final loan, down payment and monthly EMI he can afford for his house and the best option of the house in the desired city of the user.

Step 5:

Suggests the user best home buying options from other cities that he qualifies to buy a house.

**3.Justifications**

1. The need for the solution justifies the cost and effort of building an expert system:

Imagine a new home buyer traveling to every city, to check out the price of the house and every bank whether his income can satisfy the price of the house. In our Expert system, we have saved time, where we can sit at one place and calculate if the end-user can qualify for buying a house.

1. Human expertise is not available in all situations where it is needed:

With the help of our House Purchasing Expert system, human expertise might not be needed as the Expert system gives us accurate results.

1. The problem may be solved using symbolic reasoning:

The Expert system needs human skill it needs to be well studied and a certain amount of research has to be done in this field.

1. Cooperative and articulate experts exist:

The Expert system is built solely based on the experience and judgment of the experts working in this domain.

**4.Design Issues**

There were some difficult parts were over how to present the information. Problems with the format, the dollar symbol, and dealing with how prolog sees variables and strings.

Data organization, figuring out prolog conditional statements and queries.

Designing a Facts based system.

**5.Implementation Details**

This is a rule-based Expert system.

We implemented facts to designate the house size and city locations with their average minimum and maximum house prices, base interest rate by the US federal and given state property tax.

Example:

Facts:

house\_size(small).

city(sd,sd).

city(la,la).

city(sf,sf).

city(sj,sj).

house(

house\_size(small),

bed\_room(2),

bath\_room(2),

area(700,1400)

).

Rules: on how to calculate the different loan amounts, property tax, and payment plans, Expected mortgage interest rate for a given credit score, Monthly EMI, and final loan amount a buyer can borrow from a financial institution.

Few examples:

Rule1: To check the eligibility of the user to buy the house.

if total monthly payments is > 45% of monthly salary he cannot by a house

Rule2:

rule 2:

- maximum payment (MP) = (43% of salary - monthly depth)

- maximum loan payment over 30 years (A) = MP \* 12 \* 30

**6.Difficulties Encountered**

- Transitioning from C++ and Python to Prolog was a challenge. Formatting the output proved more labor and time-intensive than originally thought.

-The group project was divided among two of us, So there was difficulty in integrating the code.

-Researching in the area of home-owner qualification in California.

- Figuring out the mortgage calculations done by Financial Institutes such as credit score to interest rate calculation

**7.Performance Analysis**

It performs well without any major flaws or glitches. It starts and completes its tasks quickly.

**8.Result Significance**

The results show whether or not the user can afford to buy a home for the budget they propose.

**9.Possible Enhancements**

There many enhancements that we can make in this system starting with adding more facts into the system for different cities, getting everchanging US bond index rate daily.

Possibly a more in-depth analysis of the user finances could be worked in. Also,other factors could be brought such as whether or not the buyer is military or other such factors that would affect your loan.

**10.Future Work**

Incorporate more information about the real estate market in the cities we chose.